Research carried out in the Department of Agricultural Chemistry, Peradeniya.

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Soil Science

A study on the effect of sulphur on growth of soyabean, on a cinnamon sand soil of the Western province, indicated that these soils are deficient in this element. The responses were very significant and an application of 135 kg sulphur/ha has produced the maximum dry matter yield.

Preliminary studies on the S mineralization of selected organic residues in soils indicate that mineralization and hence the release of available S, reaches a maximum around the third week of incorporation. Considerably high amounts of S were found to be released by the mineralization of salvinia, indicating the usefulness of salvinia as a possible source of S.

Encouraged by this preliminary study, a complete survey of the S status of all the organic residues was undertaken with a grant from the National Science Council of Sri Lanka. Organic residues commonly used by farmers in different parts of the country, and those that are potentially useful are collected, as far as possible, for each type of organic residue. Samples have been from three different areas of Sri Lanka. A total of 130 samples comprising 48 different organic residues were collected and are being analysed for their S and N contents. A study of S mineralization of the promising organic residues in some selected Great Soil Groups of Sri Lanka is envisaged. Preliminary laboratory studies will be extended to field evaluations.

Zinc deficiency in rice has become a serious problem in most rice producing countries, and the Government Department of Agriculture is intending to carry out a survey of the rice fields of Sri Lanka for their Zn contents. Greenhouse experiments were conducted to evaluate various chemical extractants for available Zn in rice soils. An experiment, with two improved rice varieties (Bg 400-1 and Bg 94-1) and 9 soils from 7 different districts of Sri Lanka, indicated that either 1N NH4OAC at pH 4.6 or 0.05N HCl could be used for Zn extraction from paddy soils.

A similar study for Cu indicated that EDTA was the most suitable extractant followed by NH_4OAC (pH 4.6).

The availability of Zn to plants is affected, among several other factors, by the adsorptive and retention capacity of a soil. No information is available regarding the absorptive capacity of Sri Lanka soils for micronutrients. An experiment was conducted to study the kinetics of Zn adsorption, and adsorption isotherms in four extensively cultivated soils of Sri Lanka, including a high organic matter soil. The effect of other micronutrients on the adsorption of Zn was also investigated. The Reddish Brown Earth (RBE) of dry zone showed very high adsorptive capacity for Zn and it was equivalent to that of the high organic matter 'patana' soils. Furthermore, the adsorption maxima and the bonding energy constants were extremely high for RBE soils and suggest an imminent Zn deficiency problem in these soils. The adsorption of Zn increased with increasing pH in all those soils and decreased with increasing concentrations of the ions such as P, Cu and Mn. An investigation of the adsorptive capacity of REB and some other soils under anaerobic conditions is anticipated as a follow-up work.

The high cost of chemical nitrogenous fertilizers emphasises need to search for alternate sources of nitrogen. A promising outlook is the use of *Azolla* with its *anabena* symbiont, in the rice fields as has been practised in Indochina and Central Asia.

Research is being carried out to study the decay pattern of *Azolla* in lowland rice soils and in upland soils. *Azolla* is used either in its fresh state or as the dried material. Preliminary results indicate that maximum decomposition occurs around the 6th week after incorporation under upland conditions, and fresh *azolla* decomposes more than dried *azolla*. Also it is seen that there is a greater accumulation of available N in low pH soils; than in high pH soils. This needs further clarification. The experiment with flooded soils is yet to be completed.

Food Science & Technology.

The Winged bean (*Psophocarpus tetragonolobus*) has recently been "rediscovered" as a potentially valuable and underutilized source of protein and oil, especially in developing countries. The alarming rate of chronic malnutrition (34.7 percent) among pre-school children, the increased consumption of wheat flour (30,000 metric tons per month) in Sri Lanka, coupled with disappearance of low cost wheat and price increases in the international market justifies the use of composite flour technology in the production of bread and fortification programme for bakery products. This will undoubtedly help to reduce the malnutrition problems and to conserve valuable foreign exchange spent on the importation of wheat.

Investigations are being carried out to find suitable soaking solutions for easy removal of seed hulls of the winged bean (WB) seeds and to establish an economically and technologically feasible method for the large scale preparation of winged bean full fat flour (WBFF). Preliminary studies indicate that soaking in 1 percent sodium bicarbonate or sodium carbonate solution overnight followed by boiling for 45 minutes, is a suitable method for easy removal of seed hulls. Even though certain amounts of nutrients are lost during soaking, anti-nutritional and flatulence factors are leached out. Studies are in progress to determine a suitable wet dehulling method utilizing the existing machinery that are used to make soya, full fat flour.

The feasibility of fortifying wheat flour with winged bean flour in bread making is another line of research that is being carried out. WBFF was substituted at various percent levels into wheat flour and the rhelogical properties studies on the Farinograph, Extensograph and Amylograph.

Incorporation of WBFF decreased dough strength properties, increased water adsorption and decreased dough stretching characteristics. Amylograms show that pasting temperature increased while peak viscosity decreased with increased levels of substitution. Straight dough method with a 2-1/2 hour fermentation period and variation in the recipe were used in baking studies. Quality factors by measurement of specific loaf volume and taste panel evaluation indicates that substitution up to 8 percent WBFF produced acceptable bread. Investigations are continuing along these lines to find the cost of WBFF substituted bread and increased protein availability in terms of amino acids in the substitution. Studies will be done to evaluate the quality of WB protein by animal feeding trials (PER, NPU, etc.)

A further line of investigation is on pshysaccharides of WB. The reported slow water imbibition rate and tenderization of WB seeds during soaking and cooking is closely correlated with the type and amount of pshysaccharides in the seeds. The study of polysaccharides is also important if WB flour of isolates are considered for use in extrusion or spin-processing of fabricated food. Thus characterization of the unique pshysaccharide composition of WB seeds and a study of their properties is being investigated.